THE Cane Growers' QUARTERLY BULLETIN

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BUREAU OF SUGAR EXPERIMENT STATIONS
BRISBANE

THE CANE GROWERS' QUARTERLY BULLETIN

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This Bulletin is an official publication of the extension service of the Bureau of Sugar Experiment Stations, issued and forwarded by the Bureau to all cane growers in Queensland.

The Cane Growers' Quarterly Bulletin

VOL. XIX. 1 JULY, 1955 No. 1

The Study of Ratoon Development*

By Norman J. King

During the 1953 and 1954 harvesting seasons some ratoon failures were experienced in this area. They were found to be associated with the presence of a fungal organism—a type of verticillium—but it is not yet clear that this is the sole cause of the trouble. During the present year one of the Bureau pathologists spent a month in this district investigating the problem but was not successful in finding any predisposing condition which was common to all occurrences of the disease. We have arranged that, during the next month or so, one of our agronomists will be transferred permanently to this area, and he will concentrate on the reason for these ratoon failures, and attempt to establish a cure for the condition.

These introductory remarks bring me to the general subject of ratooning and to what we consider is a very important subject for investigation—why can we not ratoon cane for longer periods than we do? The old growers in the industry tell us that, when the industry was new, it was common to grow fifth, sixth and seventh ratoons, and we know of other countries in the world where fifth and sixth ratoons are common today. Each stalk of cane which forms part of a crop possesses several underground buds which should possess the capacity to form the next crop. Why then do ratoon crops become smaller and smaller and ultimately fail to be economic? This is a problem well worthy of study, and the answer to which could be of considerable value to the industry.

You may ask why we desire to grow more ratoon crops in an industry where legislation requires a quarter of the land to be fallow every year. To fit in with this legislation we normally work a rotation of plant, first and second ratoon, and then fallow the land prior to replanting. You will appreciate that the legislation I refer to was a restrictive measure, introduced when assignments were first fixed, and was aimed at limiting production.

We cannot see too far into the future of this industry, nor can we calculate the population which this coastal belt may have to support half a century hence. The acreage of land suitable for sugar production is not limitless and it is possible that better use may have to be made of the arable land in the good rainfall areas. If, for example, we could discover why ratoon crops become progressively smaller, and show how to maintain them at a uniform level, then more sugar could be produced on existing areas or, alternatively, some land could be used for other food crops.

Longer ratooning would assist farm economy in another way. It is frequently claimed, in discussing cost of production, that most of the plant cane value is absorbed in planting costs and that farm profits come largely from the ratoons. If cane can be made to produce more ratoon crops

*Address at Bundaberg Field Day — May 13th, 1955

then the financial position of the growers should improve simultaneously. There is no comparison today between the high costs of land preparation and planting, and the relative cheapness of ratooning with a modern tractor and grubber.

In parts of this district, and in the neighbouring district of Childers, soil erosion is becoming more and more a threat to sloping farm lands. The land is more vulnerable to erosion when it is clear of crop and when it is loose and friable after deep cultivation. Erosion damage is at its worst when the land is in bare fallow. When the hillsides are carrying young ratoon crops the incidence of erosion is much less, and it is obvious that under a system of longer ratooning the dangers of erosion would be minimised.

So much for the advantages of longer ratooning. Let us examine some of the reasons why we grow only one or two ratoon crops. I have already mentioned the limitation imposed by assignments, but there are others. In the past one of the greatest obstacles to long ratooning has been disease. Crops infected with gumming, downy mildew or Fiji diseases either failed to produce payable ratoon crops or had to be ploughed out to prevent spread of infection; but fortunately these diseases have been eradicated from this district and the growers are no longer faced with losses from these affections. The recently discovered ratoon stunting disease provides one answer to the ratooning problem. It does explain the progressively smaller crops obtained from ratoons and it is possible that, with disease-free cane, the ratoons will level out to a more uniform production. This is one phase of investigation which will be pursued in the future.

Insect pests doubtless have some effect on ratooning by reason of the damage done to underground buds. The extent of this damage under a range of conditions and with a large number of varieties is not known. However this form of damage is not considered to be a serious obstacle to growing ratoons for a longer time.

There is also the point whether, with advancing age, a cane stool retains sufficient, undamaged, underground buds to produce a good stool, and whether these buds are deeply enough situated to ensure a well-anchored stool. We have, during the past year or two, carried out some work on the subject at this Station. A large number of stools were dug carefully from the soil, thoroughly cleaned up and dissected and the condition of every bud noted. The examination was able to determine whether the existing buds were from the plant or ratoon stalks, and the study disclosed information of considerable value. One point was that the ratoon shoots tended to spring from buds not far below the soil surface—not because these were more favourably placed than the lower ones, but because the lower ones had shot and died at some earlier date.

It is not thought that short ratooning has any direct connection with plant nutrition. It is possible, with modern implements, to place fertilizer alongside the stool just as deep as with the plant cane. And the same modern implements can cultivate and produce good tilth in the interspace soil and make it a suitable environment for plant roots.

The short ratooning period is likewise not connected with the age of our lands. In the British West Indies it is still normal to grow fifth ratoons on land which has been growing cane for 300 years. In Hawaii long ratooning is practised and in Mauritius fifth and sixth ratoons are the rule rather than the exception.

It is important that we understand in greater detail the mechanism of ratooning so that, if required at some future date, the information will be available. There is no justification, at the present time, for us to worry about more ratoons, but the circumstances of the future may make it necessary to alter existing practices.

Seedling Plot at Bartle Frere

By J. H. BUZACOTT

In order to select new cane varieties suitable for the wetter sections of the north such as Babinda, Innisfail and Tully, a seedling planting programme was commenced in the Bartle Frere district in 1946. Bartle Frere was selected for the project as it is in the wet belt but not too far away from Meringa, since transport of seedlings from the seedling raising site at Meringa to the testing site had to be considered. It was also desirable to plant the seedlings on high volcanic country if possible, as it was felt that on the lower lands in the high rainfall areas the rapid spread of chlorotic streak disease would hamper the success of the work. On well drained volcanic soils chlorotic streak spreads slowly, if at all, and consequently the risk of infection of any new seedlings with the disease is less if the plantings are restricted to these soil types. Although chlorotic streak can easily be controlled by a relatively short period of hot water treatment of the planting material, it is possible that an early infection of chlorotic streak might cause severe stunting in an otherwise promising seedling and thereby limit its chances of future selection.

The actual programme of the seedling raising at Bartle Frere is still in a process of evolution. In the first year of its inception original seedlings were planted. These seedlings had to be transported as individuals in pots and this imposed certain transport difficulties. Nevertheless, a planting of some 3,800 seedlings was carried out. The planting of original seedlings, however, brought about serious harvesting difficulties and it was then decided for future plantings to make a preliminary selection from original seedlings at Meringa, dropping those varieties which had undesirable agricultural characters. On this basis two setts each of approximately 1,000 varieties were planted out each year from 1947 to 1949.

Fig. 1—Original site of seedling plot at Bartle Frere.

One of the severe limiting factors imposed on selection up to this time was found to be the low sugar content of the seedlings when grown in the

Babinda district. Accordingly, the varieties for the 1950 and 1951 plantings were only taken from those crosses which produced a high percentage of seedlings with a high sugar content. This method immediately resulted in a better sugar content in the introductions and did bring about a general improvement.

future as the whole cane breeding programme is at the present time under rigorous test and any improvements, to which experimental work points the way, will be introduced without delay. In the accompanying photographs, Figure 1 shows the location of the seedling raising project over the past seven years, whilst in the foreground of Figure 2 is the 1954 seedling plot.

Fig. 2—Site of the 1954 Bartle Frere seedling plot.

By this time methods of selection from original seedlings at Meringa had been considerably changed and the selection rate raised so that some 150 varieties were selected each year to include also varieties which appeared to be suited to various soil types. It was decided therefore since 1952 to take all varieties selected for planting in 30 or 40-sett plots at Meringa also to Bartle Frere as 30-sett plots in the following year with the exception of those vigorous types which would be obviously unsuited to a high rainfall area. The plantings of 1953 and 1954 at Bartle Frere conform to this plan but it seems likely that further modifications will be made in the near

All variety improvement is a long term project but it is felt that the extension of the variety selection plots to the essentially high rainfall area of Babinda-Innisfail districts cannot fail to have important results and it is likely that further decentralisation of seedling selection will be brought about as and when increases in staff are effected. At the present time there are, in addition to the four Sugar Experiment Stations, three major deployed selection sites. One is that at Bartle Frere (referred to above), one in Mackay serves the river lands of that district, whilst the third is designed to provide future varieties for the Maryborough and Moreton districts.

High Sulphate of Ammonia Mixtures— A Cause of Germination Failures in the Herbert River District

By O. W. D. MYATT

Although it has long been known that the incorporation of sulphate of ammonia in a planting mixture increases the risk of fertilizer burn to germinating cane setts, especially under dry planting conditions, the amount of damage which has actually occurred in the various sugar districts has never been great. This appears to be due to three main factors: (1) the predominant use of low nitrogen content planting mixtures, particularly in the central and southern areas; (2) the popularity of the stick method of planting in northern district, which necessitates the placement of the fertilizer either before or after the actual planting, and (3) efficient fertilizer machines which allow for placement of the mixture without actual contact with the planted sett.

However, with the rapid change-over to cutter-planter machines now under way in some northern cane areas, plus the increasing use of the mercurial spray attachment, which means the planting of a moistened sett, the risk of fertilizer burn becomes real. This was particularly noticeable in the Herbert River plantings during 1954, where it was directly responsible for many poor or delayed germinations and has prompted a warning to growers to make a more careful selection of their planting mixture requirements and a better adjustment of their fertilizer machines to ensure correct placement of fertilizer in the drill.

Herbert River growers have, over the years, acquired a preference for the use of fertilizer mixtures containing large amounts of nitrogen in the form of sulphate of ammonia. These mixtures may contain up to 15 per cent. nitrogen, and though used successfully in many instances with the stick planting method, their use as a planting mixture with modern planting machines may, at times, produce unsatisfactory results.

Planting mixtures generally recommended by the Bureau and which have been shown to cover planting requirements for most soil types contain from 1.0 to 1.75 per cent. nitrogen. That this relatively small amount entails a much reduced risk of burning is obvious when it is realised that in a mixture containing, say, 10 per cent. nitrogen, approximately half of it is actually sulphate of ammonia. There is no doubt about the fact that adequate sulphate of ammonia must be applied to grow a satisfactory crop, but it is equally true that this may be safely applied at a later stage of the growth of the cane.

Furthermore, mixture ingredients other than sulphate of ammonia will also damage germinating cane when carelessly placed in contact with the sett, and the use of a wet cane sett from a mercurial spray attachment has been noticed to increase this risk by inducing a "flycatcher" effect for misplaced fertilizer. All these factors make correct fertilizer placement quite important, and it is obvious that the higher nitrogen mixtures when used for planting are not particularly suitable for perfect germinations under modern planting methods.

Growers in the Herbert River area will be interested to learn that fertilizer trials have already been commenced by the Bureau in their district, and included in this year's plantings is the first of a series designed to ascertain whether the higher nitrogen mixtures used locally for planting are more beneficial than the lower nitrogen and safer mixtures normally used in most other districts.

Hot Water Treatment Against Ratoon Stunting Disease

By J. R. POLLOCK

Recommendations as to the hot water treatment for the control of ratoon stunting disease in setts were made as a result of cures effected with Q.28 heated to 50 deg. C. for 1½ hours; an additional half hour was proposed as a safety factor. It was considered that the safety factor allowed with Q.28 would cover any additional time needed to raise the interior of the thicker setts to the desired temperature. However it could not necessarily be assumed that this treatment of 50 deg. C. for 2 hours would also suffice for the control of ratoon stunting disease in all other varieties, and to test this point, a number of commercial and near-commercial canes were subjected to a range of time-temperature combinations. The control of the disease in these canes was, of course, the prime consideration but the information provided by germinations after the various treatments was also of importance. It is yet too early to examine the plots for ratoon stunting disease but germination figures are now to hand and it was considered that they would prove of interest.

The plantings of selected varieties (see Table 1) were made in the spring of 1954 at the Bureau's Experiment Stations, although at Bundaberg, where the area available for planting was limited, only the plots thought liable to give poor germination were planted on the Station, the remainder were planted on Qunaba plantation. All setts of each individual variety came from the same source, and all varieties in the one treatment were heated in one batch. Plantings of non-treated diseased cane were made in each of the five localities concerned; these were used to give comparative germinations.

TABLE 1
Varieties Planted

Gordonvale—Badila, I.222, I.235, Pindar, Trojan.

Ayr—Badila, Pindar, S.J.16, Trojan.

Mackay—N.Co.310, Pindar, P.O.J. 2878, Q.28, Q.50, Q.56, Q.58, Trojan.

Bundaberg and Qunaba—P.O.J.2878, Q.47, Q.50, Q.55, Vesta.

Qunaba—C.P.29/116, N.Co.310, Pindar.

Unfortunately before reliable germination counts had been recorded at Mackay, the entire planting was washed out by floodwaters. This section of the trial was subsequently abandoned as far as germination counts were concerned. Germination counts are set out in Table 2. Where two or more stations are listed under "Locality," the figures for each variety are averages.

TABLE 2
Hot Water Treatments and Comparative Germinations

Variety	Locality	Non-treated	50° C. 2 hr.	50° C. 2½ hr.	50° C. 3 hr.	51° C. 2 hr.	52° C. 1½ hr.	52° C. 2 hr.	53° C. 1½ hr.
		%	%	%	%	%	%	%	%
Badila ..	G–A	100	78	98	73	75	74	46	34
C.P.29/116 ..	Q	100	123	103	87	117	130	180	60
I.222	G	100	80	75	70	84	66	47	12
I.235	G	100	66	83	50	55	50	9	7
N.Co.310 ..	Q	100	104	82	76	76	78	94	68
Pindar ..	G–A–Q	100	91	88	85	75	69	61	32
P.O.J.2878 ..	BQ	100	149	200	155	90	172	134	80
Q.47	BQ	100	255	117	110	146	124	62	45
Q.50	BQ	100	100	69	32	124	60	57	42
Q.55	BQ	100	14	8	14	3	11	0	0
S.J.16	A	100	71	94	80	63	42	37	9
Trojan ..	G–A	100	77	74	63	20	160	8	22
Vesta	BQ	100	146	85	88	83	90	66	32
Mean ..		100	104	91	76	78	87	62	34

G = Gordonvale. BQ = Bundaberg and Qunaba.
A = Ayr. Q = Qunaba.

Discussion

The same number of setts was planted in each treatment and in the untreated plots for each variety on any one Station, but the number of setts planted varied from station to station. Therefore the untreated germination for each variety has been designated as 100 units, and corresponding treatments have been corrected to this base for comparative purposes. Thus while high results in the treatment columns may be due to a stimulatory effect of the heat treatment, they may be partly due to an unusually low germination in the untreated plots. Bearing this in mind, an apparent stimulation has been observed with P.O.J.2878 and Q.47 over a range of 50-52 deg. C. for 2 hours, while at 50 deg. C., Badila, I.235, P.O.J.2878, and S.J.16, have given better germinations at 2½ hours than at the 2 or 3 hour treatments. Q.55 and possibly Trojan are more severely affected by the hot water treatment than are other varieties. At 53 deg. C. the eyes of I.222 developed but it failed to produce roots. The eyes subsequently died. This was also observed with the more severe treatments of the varieties planted at Ayr. Considering the means of all varieties, at 50 deg. C. there was a drop in germination as the time of heating was increased. Similarly at 2 hours, a drop in germination occurred as the temperature was raised but a treatment of 52 deg. C. for 1½ hours gave a satisfactory count.

In considering the results given in Table 2, it must be emphasised that these figures present only a general picture of the effects on germination, for results would be expected to vary from locality to locality, and with different sources of plants.

Conclusion

With regard to the germination of most varieties, the time factor in the hot water treatment of ratoon stunting disease at 50 deg. C. may be prolonged to 2½ hours and possibly to 3 hours without undue detriment, while treatments of 2 hours at 51 deg. C., and 1½ hours at 52 deg. C. are also satisfactory. More severe treatments are likely to lead to a serious falling off in germination.

A New Stubble Shaver

By A. MATTHEWS

It has always been an accepted fact that a ratoon crop is a more economical proposition than a plant crop. Not only does the area planted represent a large outlay to a grower, but the shortage of labour presents many problems, especially for the bigger growers.

Therefore, it is of interest to describe a method of stubble shaving carried out by a Proserpine grower.

The pulley attachment of a Ferguson tractor is bolted in a vertical position to the drawbar of the tractor. The drive is from the power take-off and two universal joints are used to allow the stubble shaver to be raised or lowered by the hydraulic lift. There are eight small blades attached to the ground plate. When one end of the blade is worn out they are reversed and the other end is used.

Fig. 4.—Stubble shaver mounted on tractor.

Fig. 3.—Stubble shaver cutting the stool.

The disc is tilted at an approximate 20 degrees angle to the row. This prevents excess friction between the disc and the stools of cane. The tractor is driven in second gear at full throttle and the disc revolves at 1300 revolutions. Approximately two to three inches of stubble is removed. More could be removed if desired.

The young ratoons coming away from these stools were low in the ground and stooling profusely as all aerial shoots were removed. It is the aerial shoots caused by bad cutting that hinder the development of a good ratoon crop.

A New Ratooning Tool for Sugar Cane

By CARLOS LOCSIN

Technical Director, Victorias Milling Co. Inc., Philippines

It is standard practice in tropical sugar-cane areas to shave off the stubble left in the field after the harvesting operations if a ratoon crop is desired. The favourable effects of stubble shaving on the ratoon crop are well known. Where deep planting has been practised, deep shaving is also desired. Deep shaving gives the ratoon crop the desirable characteristics of new plant cane.

Conventional methods of shaving in the Islands are by means of hoe or cane knife and by tractor-powered machines. Shaving by hoe is usually superficial as labourers demand higher rates for deeper shaving so that it becomes uneconomical.

The prevailing horizontal disc type of tractor-powered shaver is limited in penetration by its shape. It is capable of cutting the ridge of stubble only if a ridge is present; where the ridge is not well defined the quality of shaving is not satisfactory. To accentuate the ridge, off-barring both sides of the row of stubble is resorted to, an additional operation that adds to cultivating costs.

A new tool for shaving-off the stubble of sugar-cane has now passed the development stage and is now being produced in limited quantity by the Sugar-cane Research Department of the Victorias Milling Co., Inc. for use in the company haciendas.

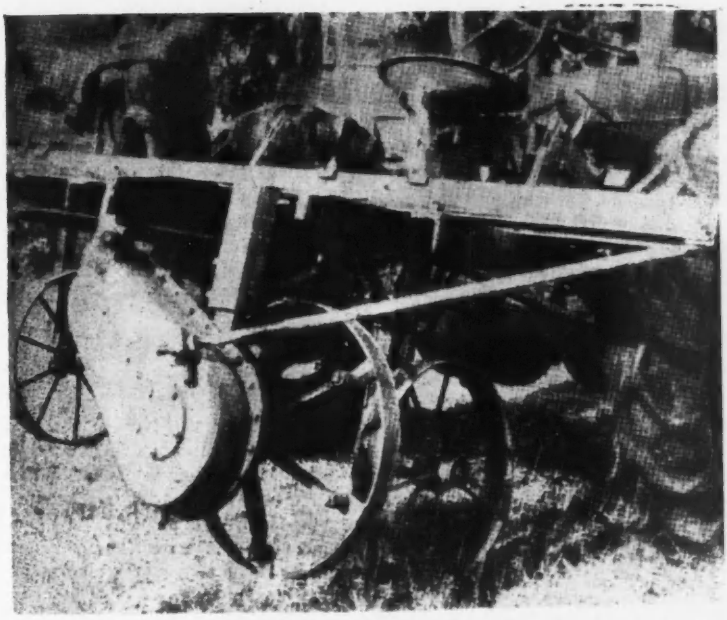

Fig. 5.—Showing details of the Philippine stubble-shaver. The encased section at the left contains the gear drive for the shaver.

The new tool is an invention of Arturo Zayco, Experiment Station Engineer of the Company. Patents for the device have been applied for.

The Zayco Shaver differs from other shavers in its ability to cut deep into the stubble and in simplicity of construction. Being a tool-bar mounted tool it dispenses with the extra man needed to regulate the depth of cut as in the case of a trailer mounted shaver. Added advantages are rapidity of turning at the end of the furrows, and strength and cheapness of the cutting element or blade.

The blade which is the expendable part of the device consists essentially of a wheel rim with a sharp edge. This blade is made from mild steel flat bar stock, cold rolled into a hoop with one edge machine sharp and hard faced with "Stellite" welding rod by oxy-acetylene welding. Six lugs are welded to the blade for bolting to the spokes of the wheel. The wheel rotates powered by the tractor through a rear power take-off shaft and its sharp edge bites into the stubble with a slicing action. A cross sectional view of the furrows before and after cutting with the shaver is shown below.

By means of suitable shields, the cuttings are more or less confined to the inter-rows, thus giving to the field conditions approximating that of new plant cane, with the cane in a furrow and with enough soil in the inter-rows for good hilling-up or on-barring operation.

A very important possibility as a result of deep shaving is the carrying over of ratoon crops for many more years than the one or two years practice now prevailing in the Islands.

The pictures show different views of the shaver mounted on a Farmall "M" tractor equipped with a "Negros" tool bar.

Maximum penetration of the shaver is 6 in. to 12 in. depending on available power. Depth regulation is by means of a gauge wheel. Depth of cut is usually determined by planting practice. Cane planted in deep furrows and given adequate hilling-up will leave a longer stubble after harvest, hence, they could be shaved deeper.

(Reprinted from Sugar News.)

Fig. 6.—"Clustered Stool"—A stool of Pindar with 64 shoots arising from a single eye, Mulgrave.

Clustered Stool

Reference has been made before in these columns to a phenomenon known as "clustered stool." It is manifested as a large number of shoots arising from a single bud of a cane plant. Formerly the condition was most common in the variety P.O.J. 2878 but it has appeared recently in Pindar and seems to occur more frequently in that variety than in any other grown in Queensland.

In Volume 3 of the Cane Growers' Quarterly Bulletin published in 1935 a photograph of a "clustered stool" of P.O.J. 2878 having 65 shoots was printed. Herewith is a recent picture of a sett of Pindar exhibiting "clustered stool" and this plant had 64 shoots. So far as is known "clustered stool" is not a disease but a freak condition of growth and does not appear on a wide enough scale to cause crop losses.

—J.H.B.

Erosion Control with Legumes

By H. G. KNUST

Cane growers in the Childers area are becoming increasingly conscious of losses from soil erosion, and although the methods practised at present undoubtedly prevent soil losses, associated cultivation and harvesting difficulties caused by point rows result in some growers being hesitant about adopting the recognised methods.

One Childers grower is establishing a trial block by planting through growing legumes, after setting contour drains which do not conform to recognised standards but are set at irregular intervals in locations which the grower considers will remove the excess water in the shortest possible time with little or no loss of soil; although point rows are not entirely eliminated they are not numerous and should not be troublesome. The slope on the block varies from about one per cent. to 15 per cent.

The legume, Reeves Selection, was planted in November, 1954, after thorough land preparation and, because of reduced summer rainfall, did not produce a heavy crop. The crop, estimated at seven to eight tons per acre (Fig. 7), was erect and, because of the absence of vining, caused little clogging of the cutter planter.

Because of the inability to secure a wavy coulter some apprehension was felt about the possibility of drilling through the legumes, but after a few minor adjustments the cutter-planter worked reasonably satisfactorily (Fig. 8). Generally, the disturbed legume passed around the drill plough and stops for clearing the plough did not exceed two per 15 chain drill.

Slight irregularities did occur in the drill-line because of the tendency of the planter to move down the slope and this may have been corrected by the use of a coulter which undoubtedly would have stabilised the planter. It will be observed (Fig. 9) that drill irregularities are not excessive, and the contour drains established by the grower can be clearly seen.

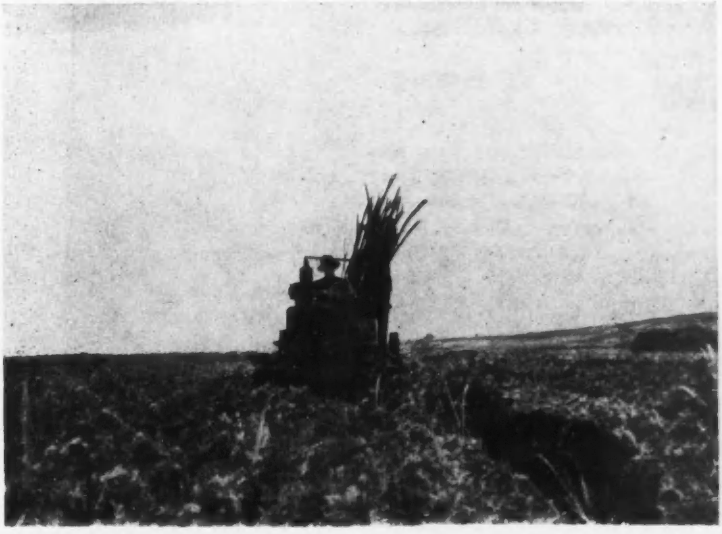

Fig 7.—A cutter-planter operating through the green manure crop.

This work indicates that it is possible to plant across a slope through a legume crop which is erect and has not vined. The use of a wavy coulter is essential for cutting the green matter and should assist in stabilising the planter.

Although this work does not conform to accepted practices it will be watched with interest as it is a genuine attempt to conserve soil, and should be superior to the practice of planting with the slope in unprotected land.

Fig. 8.—Another view of the cutter-planter. Note furrow left free of vines.

Fig. 9.—The finished field after planting.

A Boom Spray Outfit

By C. A. REHBEIN

The application of 2,4-D as a pre-emergence weed control spray is being successful in several districts and there are some growers in the Moreton area who are endeavouring to obtain control of weeds and grasses by this method. In the Coolum area, where the majority of soils are of a sandy clay-loam texture, growers are obtaining some relief from their weed troubles by using chemical sprays, and in another portion of the district, where the soil is more of a sandy loam, a Diddillibah farmer is attempting to solve his weed problem in this way also. This grower owns a Nuffield Universal tractor on which he has mounted a spray outfit which diverges somewhat from the usual setup.

The main feature of a boom spray outfit usually consists of a gear or similar type pump driven from the power take-off at the back of the tractor. Consequently, the entire outfit is mounted as a whole on a platform attached to the rear of the machine. It was decided in this case that there was some inconvenience in this method and the outfit was mounted in three separate units (Fig. 10).

The container, which is a 44 gallon drum, is placed in front of the tractor

Fig. 10.—Overall view of unit showing separate mounting of container, pump and boom.

and rests on an angle iron frame attached to the tractor chassis (Fig. 11). To avoid movement, the drum is held on the frame by three 5/16 inch rods which clip over its rim. Another rod circles the drum and bolts on to the radiator.

The pump, a Marino double action constant pressure piston type, is mounted on a slotted frame to maintain belt tension. This frame is in turn bolted to the chassis by two ½-inch bolts and is positioned on the left hand side of the tractor, approximately half-way between the front and rear wheels (Fig. 12).

Technical data for pump:—

Working speed: 300 to 400 revolutions per minute.

Capacity: Spray delivery=160 gallons per hour. Drum filler=1000 gallons per hour.

Pump weight: 75 lb.

Pressure range: 0 to 400 lb. per sq. inch.

The pump is driven from the belt pulley attachment just forward of the gear box on the left hand side of the tractor. This has a 4½ inch V pulley and, with the tractor in third gear travelling at three miles per hour, it rotates at 1,150 revolutions per minute. Connecting this pulley by V belt to a fourteen inch pulley on the pump will give the required revolutions for satisfactory pump operation. Pump pressure can be regulated by means of a spring loaded by-pass valve over the outlet line.

Fig. 11.—Container mounted on front of tractor.

Fig. 12.—Pump mounted at side of tractor.

Fig. 13.—Boom mounted at rear of tractor.

The boom, eighteen feet in length to cover four rows at one run, is attached to a light frame and is mounted on the three point linkage with two stabilisers connected to the draw bar. (Fig. 13). The adjustment to the height of the boom is in four inch spacings, from ground level to a height of three feet.

The advantage of this setup is that, with the outfit in three separate units, it is not necessary to remove either the pump or the container at any time. Therefore, to chonge over from, say, spraying to ploughing all that is involved is the removal of the boom, a two minute job, which is far better than manhandling the whole outfit. At the time of the interview, the grower had not carried out any pre-emergence spraying but had obtained good service from the machine when applying contact sprays on his headlands using a portable hand boom.

Staff Promotions and Appointments

Appointments.

Mr. B. L. Doolan has been appointed Clerk, Head Office.
Miss H. R. Pickett has been appointed Clerk-Typiste, Head Office.
Miss R. V. Paine has been appointed Clerk-Typiste, Ayr.

Promotions.

Mr. D. R. L. Steindl has been promoted to Senior Pathologist, Grade II, Head Office.
Mr. G. Wilson " " " " Senior Entomologist, Grade II, Meringa
Dr. J. C. Skinner " " " " Senior Geneticist, Grade II, Meringa.
Mr. A. G. Claire " " " " Mill Technologist, Bundaberg.
Mr. K. C. Leverington " " " " Chemist, Head Office.
Mr. R. B. Moller " " " " Asst. Agronomist, Bundaberg.
Mr. C. A. Rehbein " " " " Adviser, Nambour.
Mr. C. L. Toohey " " " " Adviser, Bundaberg.
Mr. N. G. Graff " " " " Technical Officer, Grade I, Meringa.
Mr. I. T. Freshwater " " " " Field Assistant, Ayr.
Mr. J. D. Watson " " " " Technical Officer, Grade II, Head Office.

Fig. 14.—Cane fuzz is stored in pliofilm bags and the bags electrically sealed. These precautions, plus cold storage, enable the seed to be kept for long periods.

Fig. 15.—The sealed bags of fuzz in the refrigerator at Meringa Experiment Station.

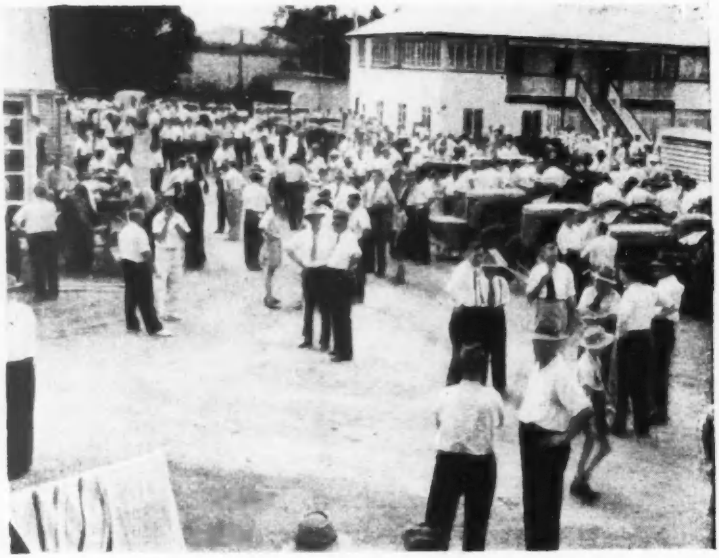

Fig. 16.—Portion of the crowd of 750 which attended the Annual Field Day at Meringa.

Fig. 17.—Two groups of visitors with their guides are seen beginning a tour of the Experiment Station. The occasion was Field Day at Meringa.

Fig. 18.—Messrs. R. Antoine and P. O. Wiehe, visitors from Mauritius, looking around Meringa Experiment Station with Mr. J. W. Inverarity on the occasion of the Annual Field Day.

Fig. 19.—A view of portion of the Meringa Sugar Experiment Station during the wet season rains. A foot of running water covered a bridge over a drain at this point.

Fig. 20.—This photograph shows a bagasse spreader used in Jamaica. The truck carries 6 tons and a conveyor-spreader at its base delivers the bagasse in a band 7 to 8 feet wide and 2½ inches deep.

Fig. 21.—Banna, Aloomba and Highleigh districts as seen from the lower slopes of Walsh's Pyramid.

A Domestic Solar Water-heating System

BY G. BATES

Since the publication of this article in the Cane Growers Quarterly Bulletin of July, 1941, there has been a steady demand for extra copies of the publication. It has, accordingly, been decided to reprint the article in full. The domestic electric hot water system is much more common today than when this installation was made; but, whereas electricity costs have soared, the price of the sun's heat is the same as before—nothing!—Editor.

Design and Construction

The idea of utilizing the radiant energy of the sun as a means of heating water is by no means new, but it appears never to have been developed in Australia, in spite of eminently suitable conditions. An article written by Dr. H. W. Kerr, and published in the "Cane Growers' Quarterly Bulletin" for April, 1936, inspired the writer to construct a domestic unit with the object of testing it under North Queensland conditions. The results have been gratifying, and the following particulars regarding the construction and lay-out of the system are furnished in the hope that others will be encouraged to adopt this simple and cheap method of heating supplies of water for domestic and other purposes. It is appreciated that there are a number of points where experience has shown that this particular installation could be improved, but on the whole it is quite efficient and supplies all the hot water needed for the home.

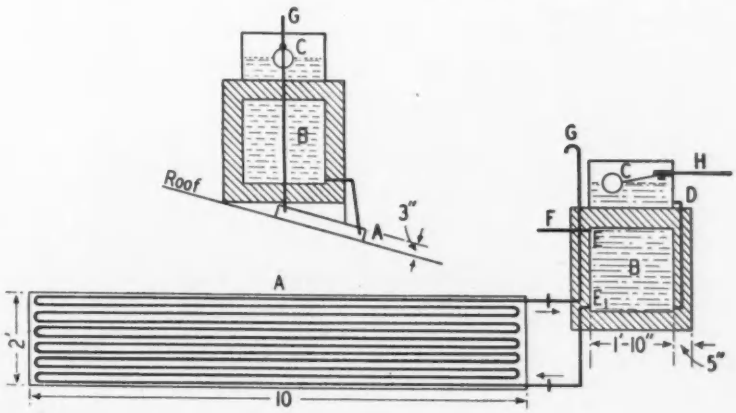

FIG. 22.—Illustrating the design of the solar water-heating system:—

A.—Absorption chamber.
B.—Storage tank.
C.—Supply tank with ball valve.
D.—Connection from supply tank to storage tank, ¾ in.
E, E1..—Connections from storage tank to heating coil, ¾ in.
F.—Connection to domestic supply pipe, ½ inch.
G.—Vent pipe, ½ in.
H.—Connection to main water supply, ½ in.

The unit consists of two distinct parts, the *absorber* and the *storage tank*. The working of the system depends upon the ability of a black surface to absorb heat when exposed to the sun, and the fact that convection currents can be used to bring about continuous circulation of heated liquids. The absorber is composed of a bank of pipes or "flat" coil of ½-inch iron water piping, set on a sheet of galvanised iron within a shallow box, and protected from the cooling action of wind by a glass cover. The coil contains twelve lengths of piping each 9 feet 3 inches long, joined together by low pressure return bends (*see* Fig. 13). This length of pipe was selected mainly because it was obtained by cutting standard lengths of water-piping in halves, thus reducing the labour required to make the coil. To increase heat absorption, the coil and galvanised iron were painted black after setting in the shallow box. The dimensions of the box in this installation are 10 feet by 2 feet, giving a heat absorbing surface of 20 square feet. The upper part of the coil is connected directly to an insulated storage tank, while a feed pipe leads from the base of the storage tank to the lower portion of the coil; the base of the absorber is set somewhat lower than the bottom of the storage tank. The storage tank is made from plain galvanised iron and is insulated by a layer of sawdust of 5 inches minimum thickness; the use of a copper tank would be a distinct improvement.

The maximum amount of heat is absorbed when the rays of the sun strike the absorber at an angle of 90 degrees, but, of course, this angle could not be maintained throughout the whole day unless the absorber were mounted on gimbals and mechanically rotated. In practice, it is found sufficient to expose the absorber on a northerly slope of the house roof at an angle of some 15 degrees from the horizontal.

The operation of the system can best be explained by reference to the diagram (Fig. 13). On exposure to the sun, water in the coil A becomes heated and rises by convection and flows slowly upwards, eventually entering the storage tank at its highest point, E. The warm water thus removed from the coil is continuously replaced by cooler water from the base of the tank through the outlet (E1). There is thus a continuous circulation of water while the sun is shining, the temperature of the water in the storage tank gradually increasing throughout the period of sunlight. The household requirements are drawn from the topmost layer of water in the tank (this being the hottest zone) through the ½-inch pipe, F. The supply in the tank is then replenished from the base through the intake pipe, D, this flow being controlled by a ball valve operating in an overhead 6-gallon supply tank, C, connected with the service supply pipe, H. In order to minimise losses by radiation and maintain supplies of hot water overnight, good insulation of the storage tank is an obvious essential.

It has been determined in the United States of America that a minimum average of six hours' sunlight per day is necessary for the successful operation of a solar heater; under such conditions, 1 square foot of heating surface (i.e., the coil and the metal to which it is clamped) will heat 1 gallon of water per day to approximately 150 degrees F., the temperature rising with increasing hours of sunlight. The storage tank should be of ample capacity, and in a domestic installation it is a good rule to allow a daily average of about 15 gallons per member of the household, although this quantity can be reduced in warmer climates.

In the installation under consideration the capacity of the storage tank is slightly less than 40 gallons, while the area of the absorber is only 20

square feet, or half the generally recommended ratio. Against this, however, is the fact that the intake temperature of the water is comparatively high.

The cost of this installation, purchasing materials at retail rates in Cairns, and having the storage and supply tanks made by a local plumber, amounted to a little more than £10. The assembly and general construction were carried out by the writer and a friend, and, once the design was worked out, the time required was not great.

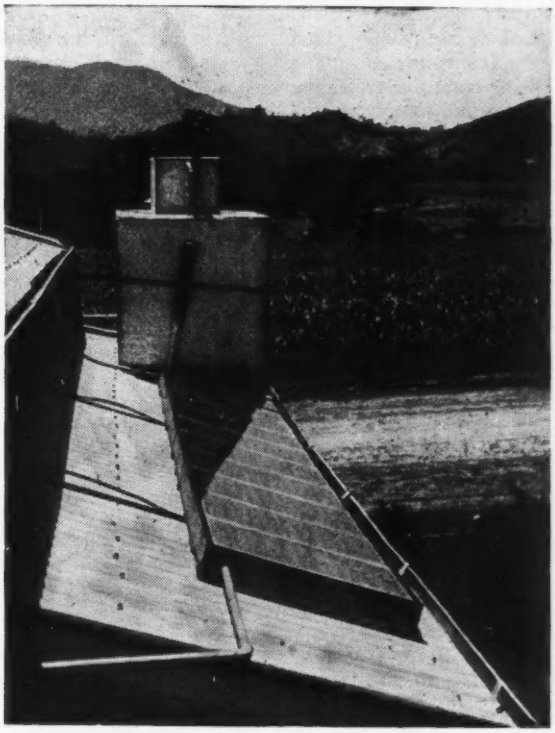

Fig. 23.—Illustrating the solar water-heating system.

Discussion

Points Requiring Adjustment.—In an actual test, it was found that the unit was capable of heating 20 gallons of water from 95 degrees to 121 degrees on a bright, clear day in December. By some attention to the following points, it is felt that the efficiency of the unit could be greatly improved.

1. At present the tap over the kitchen sink is connected to the storage tank by 28 feet 6 inches of ordinary ½-inch uninsulated water piping. The substitution of lightly insulated ⅜-inch copper piping would eliminate much of the heat loss in transmission; moreover, in most cases it will be possible to place the storage tank much nearer the kitchen—where water is most frequently drawn. Uninsulated iron piping is also used in servicing the bathroom and wash basin.

2. Both the storage tank and the absorber rest on the roof, and, after 3 p.m., the tank, being on the western end, begins to shade the absorber. The best position for the storage tank is above the house ceiling, under cover of the roof.

3. The insulation of the absorber box is quite inadequate; the galvanised iron base rests on the galvanised iron roof, instead of being supported on an insulated floor, while, at the time of the above recorded tests, the panes of glass were laid loosely on the top of the box, instead of being sealed in. It is obvious that much valuable heat would be lost by these defects.

It has been stated earlier that the unit is operating in a manner satisfactory for our purposes, and this is no doubt due to the fact that the capacity of the storage tank is much greater than actual requirements. Nevertheless, it is obvious that with the provision of the recommended proportion of absorber surface (i.e., 1 square foot per gallon of tank storage), and the elimination of the above-mentioned defects, it would be very easy to get a daily supply of 40 gallons of hot water at a temperature in excess of 150 degrees F.

Suitability for North Queensland Conditions.—We have pointed out that a minimum of six hours' sunlight per day is necessary for the efficient working of solar heaters, and thus Queensland should be almost an ideal place for their installation. Actually, some heat is absorbed even on cloudy days, but it must be expected that there will be times in the wet season when very little heating will take place. In order to investigate this point, the weather records compiled over the past four years at our Meringa Station were carefully examined. For the purposes of comparison and using 10 per cent. groupings, days with 0 to 30 per cent. of cloud were taken to be clear days; 40 to 70 per cent., to be partly clouded; and 80 to 100 per cent., clouded. On the basis of this assumption, the average number of days in each category for the four years 1937-1940 was as follows:—

Month	Clouded	Part Clouded	Clear	Average Max. Temp. °F.
January	12.5	6.5	12.0	91.7
February	11.5	6.0	10.5	90.8
March	12.0	6.0	13.0	89.1
April	9.0	7.5	13.5	86.4
May	9.5	9.5	12.0	84.0
June	10.5	7.0	12.5	81.0
July	11.5	7.5	12.0	78.4
August	8.5	4.5	18.0	81.2
September	6.0	6.0	18.0	85.0
October	7.0	7.0	17.0	88.3
November	8.5	6.5	15.0	91.2
December	3.0	7.5	20.5	92.6
Total	109.5	81.5	174.0	

From this, it is computed that on approximately 110 days per year, a solar heater in North Queensland would operate at materially reduced or low efficiency. On the other hand, with a suitably sized storage tank and adequate insulation, there is some carry-over of hot water from day to day, so that a single day's cloudy weather would not seriously interfere with the operation of the system.

The records were then further searched to determine the number of days beyond the first, which were included in two-day or longer cloudy periods. The average number of such days was as follows:—

January	8.25
February	7.25
March	11.0
April	5.5
May	3.0
June	4.25
July	6.25
August	3.5
September	2.25
October	1.75
November	4.25
December	1.0
Total	58.25

That is to say, on the basis of low efficiency on cloudy days, and lack of carry-over of hot water beyond the first cloudy day, on the average, hot water would not be available on some sixty days of the year, and on these occasions would have to be obtained from the supplementary source, whatever it might be, which had been operated in the past. On the other hand, residents of North Queensland could rely upon a free supply of hot water from a solar heater system for some 300 days of the year.

This period of constant hot water service would naturally be increased in areas west and south, where the proportion of cloudy weather is much less. Even in the north it could be further increased by the installation of a larger unit and provision for greater carry-over.

Refinements in Design of Solar Heaters

The solar heater has been extensively developed in the United States, and particularly in California, where the ratio of cloud is low, and temperatures are mild in winter. It is used for heating water for hotels, apartment houses, industrial processes, for use in dairies, and for domestic purposes; in Hawaii, the system is widely used on the sugar-cane plantations. Such installations naturally require the operation of very efficient units.

W. M. Farral, of the University of California (Bulletin No. 469, June, 1929), has carried out a thorough investigation of the principles of solar heater design and operation, and has found very considerable variation in

the efficiency of different types. Contrasting black versus white absorbers, he found that, over a given period of exposure to sunlight, the standard black painted absorber raised the temperature of the water some 16 degrees F. more than did the white painted absorber.

In order to increase the heating surface of the absorber beyond that of the surface area of the actual pipes, it is usual to clamp the coil to a metal plate (both being painted black), but better contact (and hence better heat conduction) between the pipes and the remainder of the absorbent surfaces is obtained by the affixing of metal fins to the pipes. A less expensive but efficient practice is to embed the coil partially in a thin layer of concrete, which forms a very efficient absorbing and conducting medium.

The value of the greater heating surface, such as is obtained by embedding the coil in a concrete bed, and of the use of glass to reduce the cooling effects, is demonstrated by data submitted by Farral, as under:—

Type of Absorber	Temperature Increase in Water, °F.
Simple absorber, uncovered	9.6
Simple absorber, glass covered	15.7
Coil embedded in concrete, uncovered	15.5
Coil embedded in concrete, glass covered	19.0

By the use of a double layer of glass, re-radiation of absorbed heat may be reduced to a minimum and the heating capacity of the heater correspondingly increased; insulation of the absorber is also of great importance in the achievement of best results. Farral, working with an absorber insulated with 3 inches of cork board, has obtained air temperatures as high as 230 degrees F. beneath a single layer of glass, and 280 degrees F. beneath a double layer of glass.

Conclusion

The solar heater method of heating large quantities of water is obviously well adapted for exploitation under the bright sunshine characteristic of Australia, and particularly of Queensland. It is, therefore, astonishing to find that the principle has never been adopted here. Enough has been said to demonstrate that the monetary outlay required for the installation of a domestic solar heating system is within the means of every householder; that the unit may be built by any enthusiastic amateur; and that a satisfactory hot water supply is assured even in the most cloudy part of the State. In a properly constructed unit the first outlay is the only outlay, and thereafter, year after year, the supply of hot water is available—convenient, abundant, continuous, and *free*.

Some Recent Developments in the Study of Ratoon Stunting Disease

By C. G. HUGHES

Although the Supervisors who attended the two field days at the Bureau's Pathology Farm earlier this week will have heard already about the recent discoveries made concerning ratoon stunting disease, it was thought desirable to feature them in the proceedings of this Conference so that they may be subjects for discussion and also be on permanent record.

Some of the discoveries may have an immediate importance but others may be of more significance as the various pieces of the jig-saw puzzle which is ratoon stunting are fitted into their proper places. There is no point in attempting to assign each discovery to one or other of these categories and in the following notes the various items are not arranged in any particular order.

Extracts of corn and sweet sorghum plants inoculated some time previously with infective juice have proved infective when inoculated into setts of Q.28; extracts of inoculated wheat and oats plants gave negative results while results are not yet to hand for a number of other grasses.

Infective cane juice will retain its infectivity for four days when kept in an ordinary household refrigerator and for at least 26 days when stored in a deep-freeze unit at –5deg. F.

Treatment of cane setts with various antiseptics *after* inoculation by wetting with an infective knife did not prevent the development of the disease.

Diseased juice was rendered non-infective by an exposure of two minutes to one per cent. and 0.5 per cent. "Lysol" (but not to 0.1 per cent.), one per cent. "Dettol," .05 per cent. "Zephiran" and 1.66 per cent. "Phenyle" but not to 0.1 per cent. phenol. "Phenyle" two per cent., "Dettol" one per cent., "Aretan" one per cent., phenol 0.5 per cent. and "Lysol" one per cent. were unsuccessful as knife sterilants when used on very tacky knives. Further experiments with these materials, using various swabbing and scrubbing techniques, are proceeding.

Root inoculations of young stocks of Q.28 have shown that the disease is easily transmitted by cutting roots with a knife smeared with infective juice, or by cutting roots immersed in infective juice or by pouring juice on roots exposed by gently scraping away the soil.

Sectionings of all stalks in many stools have demonstrated that when examining a field of plant cane for ratoon stunting disease it is only necessary to take primary shoots, since the disease does not normally show in secondary or later shoots unless it also shows in the primary and it may show in the primary alone. The chances of picking up the disease in spot examinations of commercial fields is increased even further if the primaries are taken only from the poorer stools.

Results of trials harvested as plant crops during 1954 indicated that several of the commercial varieties are sensitive to the disease even in the plant crop. Losses of the order of one ton of *sugar* per acre were recorded in Trojan, Vidar, Pindar and N.Co.310. Details of the various trials have already been published in the Cane Growers' Quarterly Bulletin (Jan., 1955).

Probably the most important discovery from the point of view of the work of the Cane Pest and Disease Control Boards is that the disease produces characteristic internal symptoms in very young shoots arising from diseased setts. The colour is a pale but definite salmon-pink blush, which shows in the very young immature nodes up to within half an inch or so of the growing point. The colour is quite characteristic and has not been found associated with any condition but ratoon stunting disease. It is, however, quite fleeting and longitudinal sections have to be examined immediately they are cut and in bright natural light. It may be first seen in the very young shoot when the growing point is still well below ground level. It is not so generally seen in small ratoon shoots, although sufficiently often to be of value in many varieties, and is comparatively rare in mature cane. It has been found extremely useful in confirming the disease in rapidly growing crops when the discoloured bundles characteristic of mature stalks are not well developed; in these instances the pink nodal colour should be looked for in any comparatively young suckers.

Mechanical Harvesting and Co-operative Ownership

By C. G. STORY

Reprinted from the Proceedings of the Queensland Society of Sugar Cane Technologists

Introduction

Harvesting difficulties have become greater during the past five years due to increased tonnages, higher crushing rates, labour shortages, unsuitable migrant labour, and lowered efficiency of canecutters during the hot weather conditions which occur at the end of the crushing season.

A number of successful harvesting machines have been developed, but their use has been precluded by:—(1) economics, (2) the fact that, generally, growers have preferred manual cutting of cane where men are available, as the industry requires a seasonal population to assist in producing the crop, and (3) the hesitancy of the individual grower to accept a harvester because of his opinion on particular requirements. The latest addition to farm mechanisation—the front end loader—will occupy a prominent position in the harvesting programme. Present indications are that there will be a rapid increase in the production and use of these machines.

Although mechanical harvesting with the more costly equipment has been beyond the means of the average individual grower, co-operative ownership of a machine by a number of canegrowers is possible, as is illustrated by the successful operation of a group harvesting scheme for the last four seasons by the Dumbleton Harvesting Committee.

Dumbleton Harvesting Committee

The difficulties associated with the 1950 harvest and the increased efficiency of locally invented harvesting machines caused the Dumbleton Branch of the Farleigh Mill Suppliers Committee to hold a meeting on the 7th February, 1951, to investigate the possibility of forming a mechanical

harvesting group and to consider the purchase of a harvesting machine. This Committee, comprising 13 cane-growers, was subsequently known as the Dumbleton Harvesting Committee. A sub-committee of five members was appointed to investigate the most suitable type of harvesting machine and tractor available for the purpose of the Committee.

The Rasmussen cane harvesting machine was recommended and steps were taken for the immediate purchase of a Massey Harris tractor to allow the harvester to be constructed before the 1951 crushing. Members decided to impose a capital levy of 1/- per ton on all cane produced by each member, irrespective of whether or not he used the harvester. An operating levy was also to be paid on the cane actually harvested. An authority to impose these levies was arranged by Farleigh Mill and signed by all growers concerned. A balance sheet is prepared every month and a progressive account is maintained of all detailed costs and receipts. The whole scheme operates on a business basis and is controlled by a legal agreement which guarantees members efficient and effective control of their harvesting equipment. This covers the conditions of membership, the rights and responsibilities of members, and the method of operating the harvester.

A Management Committee comprising the Chairman, Secretary and Treasurer is vested with authority to operate the machine on behalf of the Committee. It has complete control for a period of 12 months, including one harvesting season. These three members set out the harvesting roster for each grower or group of growers who have cane cut every second day. If a minor breakdown or hold-up occurs on a grower's property it is the responsibility of that grower to have the machine mobile, or to contact the

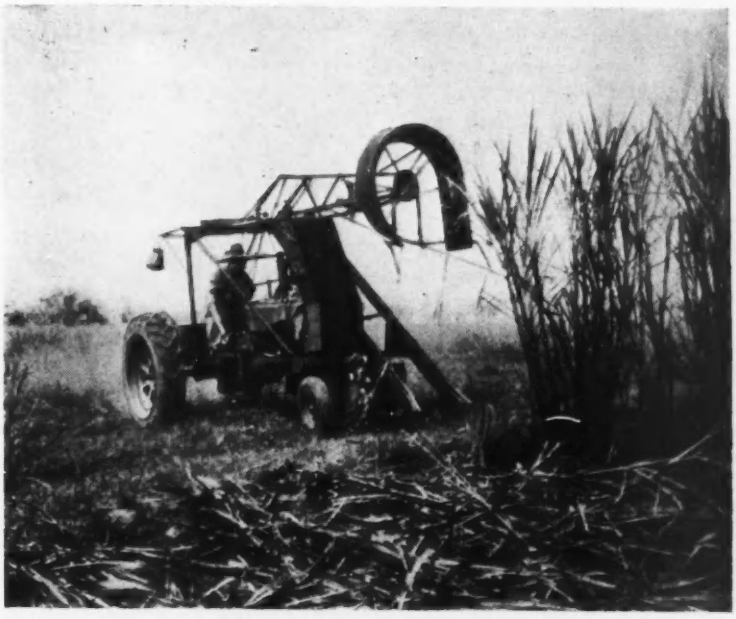

Fig. 1—The Rasmussen cane harvester.

Management Committee in case of larger breakdowns, many of which are repaired by available members of the group. The tractor agent gives a first class service in this respect. Despite the authority of the Management Committee, a special meeting is called for the whole committee to define matters of policy.

Co-operation by the respective mill is essential to the success of any mechanical harvesting scheme and the Committee is indebted to Farleigh Co-operative Milling Association for assistance which has been readily available at all times.

Operations

1951—During the first season of operation, the group experienced a large amount of trouble from various causes. The extraordinary expenses incurred forced the doubling of the original operating levy agreed to by members. Lost time, due to breakdowns, with consquent losses in revenue due to the machine harvesting of the 70 acres of standover cane which would have been practically impossible to harvest with the available labour.

1952—The experience gained in 1951 was valuable for the ensuing seasons in time-saving, both in harvest and repairs. The operation during the 20 weeks of this season was very satis-

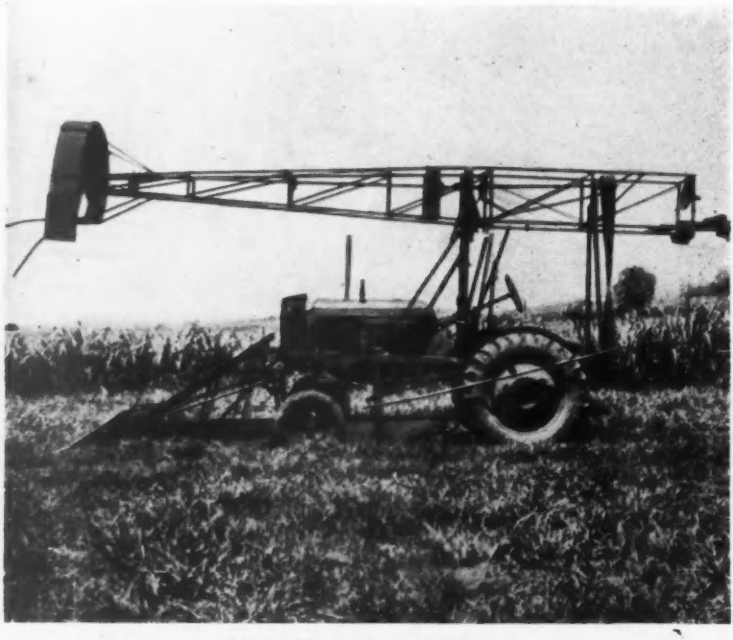

Fig. 2—The Brooks cane harvester.

only 5,288 tons out of a total of 9,977 tons, was a big factor in the increased levy, but, one compensating factor was the handling by the machine of most factory; a total of 9,580 tons was harvested from 545 acres by machine, and 780 tons from 35 acres by hand. Conditions were ideal for harvesting and

growers co-operated fully with the machine. There was a marked contrast in the operating levy for the two seasons. During 1952 this was increased by only 3d. per ton whereas in 1951 it was doubled. The slight increase of 3d. per ton was necessary as the result of constructional alterations in both tractor and harvester. Crop lifters which were fitted to the machine assisted the harvest, particularly in badly lodged crops of ratoons.

1953—The crushing season extended over 23 weeks during which period the machine handled satisfactorily 15,000 tons from 713 acres. The crop was very suitable for mechanical harvesting and seasonal conditions remained good throughout, except for a few days at the end of August, when some cane fields were too wet for the harvester to operate satisfactorily. However, as soon as the land was suitable for carting cane the harvester could operate efficiently. The experience gained from the previous seasons allowed the harvester to maintain a tight schedule for cutting times due to co-operation of members in respect to cultivation, arranging of burning, grouping for harvesting and assistance generally in repairs. Alterations, modifications and permanent improvements to the harvester were valuable in eliminating lost time. One noteworthy feature of 1953 was that the debt to the bank was completely repaid and the Committee's assets became debt free during the 1953 season. This season's operations alone proved the value of co-operative ownership. There was an overall saving to the members, over ordinary harvesting methods.

1954—This season extended over 26 weeks; the harvester handled over 15,000 tons and approximately 1,600 tons were cut by hand. In contrast to 1953, the crop was not as suitable for mechanical harvesting because weather conditions kept the crop green practically throughout the season. As a consequence heavy growth of the top resulted in semi-erect and, in some cases, badly lodged fields. Tractor breakages and slow adaptation for the work by a new driver brought about a slight increase in the expense levy, but, as in all the previous four years' operations, there was, at the end of the season, a fair credit balance in the operating account. The operation of the harvester again showed a return to the members and demonstrated further the value of co-operative ownership.

Loading

The harvester cuts and tops the cane leaving it remain along the row, where it is picked up by hand and loaded on truck waggons. Generally, inexperienced men sign on to load this cane, but, after one day, they become expert at this work. One team of three loaders in a 4,800 ton grower group made £30 each per week clear of tax for the season and another team of two loaders similarly averaged £38/10/- gross per week for the whole season allowing for wet weather delays. Their top performance was approximately £60 gross per man for one week's work. The Committee has not experienced difficulty in obtaining men for this work; some have returned for a second and a third season, but most of the growers have new men every year.

General

The continued success of operation depends upon the active co-operation of members. It is very important that members complete the following preparations before the arrival of the machine—

(a) cut the break drill.
(b) arrange burning, so that an excess quantity will not delay the machine from schedule.

Grouping within the Committee is a good idea, as less time is spent travelling and thus more cane may be harvested on the particular farm of the group for the period allotted. The loaders follow the group circuit concerned. Selection of a co-operative driver is necessary; fortunately, in the four years concerned, this has been possible.

The harvester has been delayed by wet weather only on occasions when it has been too wet to cart. It has handled semi-erect cane reasonably well, but badly lodged cane is difficult to handle in large amounts. The harvesting rate of the machine on a field is approximately an acre per hour. The scheme benefits the grower on a small allotment, who has time to load his own cane but not to cut and load. For example, two partners with a 1,250 ton crop have their cane cut for the operating levy, and both load their daily allotment of trucks in under half a day, carting with horses. For the remainder of the day, both are engaged on field work. The machine cuts two days' allotment at one time and these growers load in less than two separate half days.

Although some individual harvester owners assisted neighbours to finish their harvest which was behind schedule due to labour shortages in the 1954 season, co-operative group harvesting has paid dividends for the Dumbleton Harvesting Committee during the last four years and members are now prepared to undertake full mechanical harvesting, both cutting and loading.

Mechanical Loading

It is considered that the mechanical loading of cane will be established in the industry more quickly than the mechanical harvester.

A suitable loader would be valuable to such a group as the Dumbleton Harvesting Committee. Benefits from manual cutting and mechanical loading have already been proved in the Eton, Pinnacle and Walkerston areas of the Mackay district. In one instance in the Walkerston area one canecutter cut the equivalent of 12 trucks per day with an average of 2 tons 4 cwt. per truck for a period of four weeks. The cane was a 35 ton per acre crop of ratoons. This was all loaded by the grower with a Ferguson front end loader and the man at the end of the day was not as fatigued as when he was cutting and loading cane with a partner. In another case a machine loaded 268 tons of cane in two days keeping pace with 12 cutters and four truck waggons. The cane in question was 8—9ft. long and not particularly straight.

Conclusion

That co-operative ownership and operation of a mechanical harvester is possible in the Queensland sugar industry has been proved conclusively by the twelve members of the Dumbleton Harvesting Committee who have pioneered this harvesting scheme in Mackay. They have completed four seasons and have harvested successfully over 46,000 tons of cane. The members are satisfied to continue both with mechanical harvesting and co-operative ownership and have decided to invest money in a new type of harvester and mechanical loader when suitable machines are available so that the complete operation is mechanised.

Acknowledgment

The writer wishes to record his thanks to the Secretary and members of the Dumbleton Harvesting Committee for the information supplied.

Bureau of Sugar Experiment Stations, Mackay.

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Poor Patches in Cane Fields

The field staff are often asked advice regarding poor patches in cane fields. These are caused by a number of things, but are frequently due to a sandy subsoil. In the granite soils of the scrub areas where creeks are numerous this condition is often found. Due to the high rainfall these creeks change course frequently and leave a layer of soil on top of coarse sand.

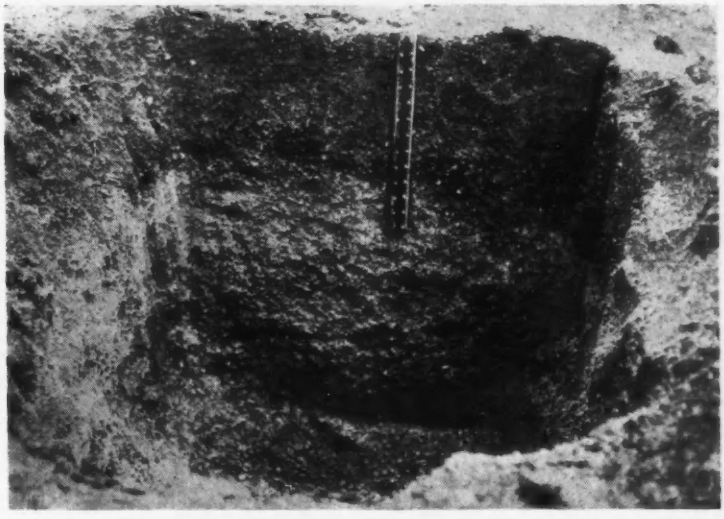


Fig. 63—Showing gravel and sand eight inches below the soil surface—Babinda area.

The accompanying photograph shows soil to a depth of eight inches and under that the sand and gravel. It is first class material for cement work but useless for cane, as it has no plant food and will not hold moisture. The result is a poor patch in the field which, with every attention, cannot be made to produce cane equal to that from the balance of the field. In one such field examined, the course of the old creek bed could be traced, and borings with an auger demonstrated that the distance to the gravel could be accurately gauged by the height of the cane. A similar condition is also noted in the Mulgrave area, along the original course of the Mulgrave River, which was altered in the dim past by volcanic actions.—G.B.

Random Gleanings

Not many years ago the cutter-planter appeared to be the last thing in planting machinery. But evolution and new circumstances have a habit of producing new inventions which incorporate new ideas. The rising incidence of pineapple disease forced many growers to discard cutter-planters and return to the "drop" machines, since protection of plants with mercurial solutions could be achieved only by dipping of setts. Then came the spray device, attached to a cutter-planter and this was improved to the stage of giving good coverage to the sett falling in the planter chute. In the last year or so the industry saw the development of the cutter-dipper-planter which immersed the cut sett in a mercurial bath before planting it. Today there are being developed two newer machines which do a similar job with a reduced labour requirement. Queenslanders have always been well to the fore in sugar mechanisation, and these new devices will maintain the reputation which has been earned in the past.

Queensland's 22 Cane Pest and Disease Control Boards met in Annual Conference in Brisbane on April 20th. Since the inauguration of such conferences in 1935 this meeting was the largest, and was the first occasion on which all Boards, compulsory and voluntary, were represented. The 1955 Conference also witnessed the achievement of a goal whereby all commercial sugar-cane grown in the State comes under the inspectorial eye of a Cane Pest and Disease Control Board. For the first time New South Wales was represented by observers at the Conference, the field chemists of Condong, Broadwater and Harwood being present.

During the past year or so, several well-known sugar scientists from overseas have visited Queensland to see our industry at first hand. The latest are Mr. P. O. Wiehe, Director of the Mauritius Sugar Industry Research Institute, and Mr. R. Antoine, Pathologist from the same organisation. After attending the Conference of Cane Pest and Disease Control Boards in Brisbane and also the Conference of the Q.S.S.C.T. in Cairns, they visited Innisfail, Tully, Ingham, Ayr, Mackay and Bundaberg before departing for Fiji. Both were particularly interested in the methods being used for control of ratoon stunting disease in this country. Mr. Wiehe confirmed the existence of the disease in Mauritius where, he stated, it was widespread.

It is pleasing news that a concerted attack is to be made on the Giant Sensitive Plant (*Mimosa invisa*). During April a meeting was convened at Innisfail by the Superintendent of Stock Routes, Department of Public Lands, and representatives of the various Shire Councils, Cane Pest and Disease Control Boards, Lands Department, Department of Agriculture and Stock and Bureau of Sugar Experiment Stations were present. This plant was declared a noxious weed for the whole State of Queensland as far back as 1948, when the Bureau made the necessary approach to the Director of Local Government, but since that time it has spread alarmingly. It is now proposed to spray aerially the two large infestations at Cowley and Tully, and to tackle the smaller patches by ground spraying and burning. Control will not be easy, and complete eradication will take years of careful work. The giant sensitive plant seeds profusely, and annual regeneration will demand a well-planned, follow-up campaign.

An article appearing in this issue describes a stubble-shaving implement designed for use in the Philippines. This is of exceptional interest in itself

and calls to mind the various attempts made to popularise stubble-shaving in this country. During the thirties a machine with twin discs was demonstrated by the Bureau, and although it operated successfully—particularly in the Lower Burdekin—it failed to impress growers. Later, other types were developed, but did not extend beyond a few farms. It would appear that, with modern tractors fitted with three point linkage and hydraulic lifts, there is scope for a power-driven unit. The ridges left by many growers after hilling up onto ratoons should be removed, and a stubble-shaver is the ideal implement for the purpose. Another article in this issue describes a unit driven from the power take-off of a tractor, but no implement manufacturer has yet marketed a shaver designed for attachment to any of the well-known makes of tractors.

The recent Technologists Conference in Cairns was the occasion for considerable discussion among agricultural delegates regarding ratoon stunting disease and hot-water treatment tanks. One point which did emerge very clearly was that heat distribution in bags or baskets of cane plants was not so simple a matter as was previously accepted. We are dealing with a material which is, in itself, a fairly good insulator by reason of the woody fibres which are concentrated near the rind of the setts, and unless the hot water can circulate very freely there is danger of some setts not receiving the full curative treatment. Another point brought out by some representatives of instrument firms was that thermometers are not so reliable under varying conditions of usage. It was, doubtless, news to a lot of people that a thermometer would record temperature accurately, only if immersed to the correct depth for that type of instrument.

The tractor and implement display at Meringa Field Day included something new in the sugar industry. A Mareeba engineer who had developed a new super-high-clearance tractor for spraying tobacco crops brought his invention to Meringa where it attracted considerable attention. It is a three-wheeled structure built of tubular steel and having a clearance of eight or nine feet. The small 8 h.p. engine which propels it is mounted on the front and drives onto the front wheel. The frame carries a 44 gallon drum of spray fluid, and a boom spray can be attached for spraying tall crops. It does not appear to have any particular advantages for sugar cane since that crop is not sprayed; and, of course, weedicide spraying is carried out when cane is quite small. However, the idea is an ingenious one and would be the answer to any problem which involved spraying of advanced cane.

One logical development from the cure of ratoon stunting disease is to assess the relative performance of old and new varieties. It is now known that some of the older canes lost favour, and were replaced by newer productions of the cane breeder, because they gradually contracted ratoon stunting disease and for that reason yielded less and less as time went on. The hot-water treatment gives rise to disease-free stock and the capacity of the variety to produce is as good as when it was first bred. The Bureau is therefore interested to find out how much better are our new varieties than the ones which used to be grown ten or twenty years ago. Visitors to the Bundaberg Field Day in May saw a large, newly-planted trial in which M.1900 Seedling and P.O.J.2878 were planted alongside such modern canes as Q.50, Vesta, C.P.29/116 and others. At the same time other, older canes are being repropagated so that trials including D.1135, Q.813 and P.O.J.-2714 may be planted in the future. It is interesting to record that all three of these canes have practically disappeared from the State and it is necessary to build up stocks from an odd stool.

The Bureau is awaiting with interest the results of stock feeding trials being conducted at Yeerongpilly Animal Health Station with molasses-bagasse mixtures. The Bureau interested itself in this matter as a means of disposing of excess bagasse and, at the same time, pointing the way to a new industry for manufacture of a palatable, easily transportable stock food. Molasses is in high demand for stock feeding particularly in times of drought but it is costly when conveyed in drums and is difficult to handle as a feed supplement. The mixtures, containing some 60 to 70 per cent. of molasses, are dry and crumbly, and can be transported in jute sacks. An experimental lot, amounting to a couple of tons, was prepared and sent to Yeerongpilly where arrangements were made with the Department of Agriculture and Stock to carry out the feeding trials. Perhaps this trial may be the first step in a new industry for sugar millers.

As a further step in the Bureau's cane breeding and selection programme a seedling sub-station has been arranged in the Mourilyan district. Some years ago it was recognised that varietal selections made at Meringa may not necessarily supply the requirements of the wet belt between Babinda and Tully, and a sub-station was located at Bartle Frere. Nothing of any importance has emerged from the work conducted at that centre but it has been felt desirable to extend the activities into the Innisfail area. The land chosen at Mourilyan is the flat red-schist soil type which is characteristic of much of the Mourilyan land. Beginning with the 1955 planting season, at least one thousand new seedlings will be introduced each year and these will be selected and their performance observed through progressive trials. It is reasonable to assume that there is more chance of obtaining outstanding varieties if the original seedlings are grown and selected in the environment in which they are to be planted ultimately as commercial canes. Six acres of land have been made available for this work.

In parts of the sugar belt the flowering creeper known as Star of Bethlehem is considered a pest in sugar cane fields. It is most noticeable after the crop passes the out-of-hand stage, when it climbs around the stalks and tops and sometimes causes an impediment to harvesting. The plant is extremely sensitive to 2,4-D and both the larger creepers, and the small seedlings sometimes present around the base of them, can be readily killed by a light spraying. One ounce (approximately a match tin full) to a knapsack of water gives a spray of sufficient strength to kill the Star of Bethlehem without affecting the cane; only a very light spraying is necessary. Since the pest normally occurs in patches, a knapsack of solution will be adequate for quite a good area. Death of the creeper is not immediate, usually taking some days. Nevertheless the kill is complete, and the method is much less arduous than hand-pulling which is the usual procedure when germination has taken place within the stools of cane.

FREE SERVICES TO CANE GROWERS

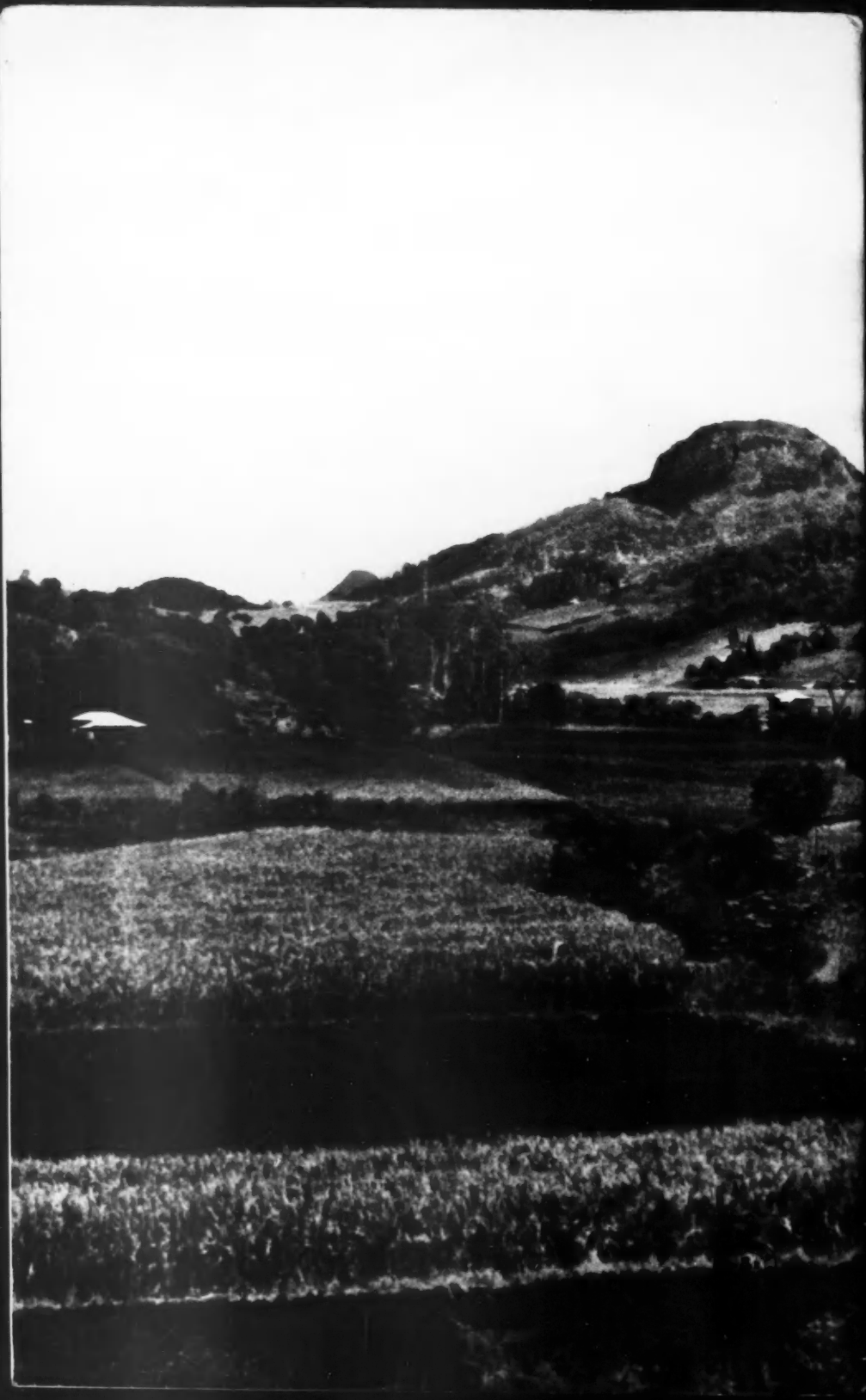
The Bureau offers the following free services to *all* cane growers in Queensland:—

Soil Analysis and Fertilizer Recommendations

Your soil will be analysed by the most modern methods, and a report will be posted containing a recommendation covering the type of fertilizer required, the amount per acre, the need for lime, and other relevant information. Phone the nearest Bureau office and the soil samples will be taken as soon as possible.

Culture for Green Manure Seed

The Bureau laboratories in Brisbane will post to any cane grower sufficient fresh culture to inoculate seed of cowpeas, velvet beans, mung beans or other types being grown. Instructions for use of the culture will be enclosed. Address your request to The Director, Bureau of Sugar Experiment Stations, Brisbane, *but allow at least a week, after receipt of your letter, for the culture to be prepared and posted.*

Advice on All Phases of Cane Growing

The Bureau staff is at the service of all cane growers. They can best advise you on matters pertaining to varieties, fertilizers, diseases, pests, drainage and cultural methods. Bureau officers are available in every major cane growing district. A phone call will ensure a visit to your farm.